

# **Strait Flow Monitoring Using Trawl Resistant Bottom Mounted Acoustic Doppler Current Profilers**

PI: R. Dwi Susanto  
Lamont-Doherty Earth Observatory of  
Columbia University  
61 Route 9W, Palisades, NY 10964  
Phone: 845-365-8545 fax: 845-365-8157 e-mail: [dwi@ldeo.columbia.edu](mailto:dwi@ldeo.columbia.edu)

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## **LONG-TERM GOALS**

The long-term goal is to determine the seasonal reversal South China Sea – Indonesian Seas Transport/Exchange (SITE) flow and its influence to primary Indonesian throughflow (ITF) and dynamics of South China Sea (Figure 1).

## **OBJECTIVES**

The main objectives are (1) to measure the magnitude and its variability of the water mass transport/exchange between the Indonesian Seas and South China Sea (SCS) in the Karimata Strait; (2) to determine the effects of this flow and property flux from the tidal to seasonal variability on the circulation and mesoscale dynamics in the internal Indonesian Seas and the South China Sea.

## **APPROACH**

- ✓ Having international collaborative research among scientists from Lamont Doherty Earth Observatory (LDEO) United States, and Agency for Marine and Fisheries Research (BRKP) Indonesia and First Institute of Oceanography (FIO), China.
- ✓ Because I got funding for instrument only, I used institutional support to deploy the mooring, with a note that formal proposal will be submitted to NSF or ONR.
- ✓ Deploy three bottom mount ADCPs in the Karimata Strait
- ✓ To combine with INSTANT (International Stratification and Transport Program) data to determine the effects of the SITE flow and its interaction with the primary Indonesian throughflow and their consequences to stratification, upwelling and mesoscale features in the Lombok Strait and other straits to the east.

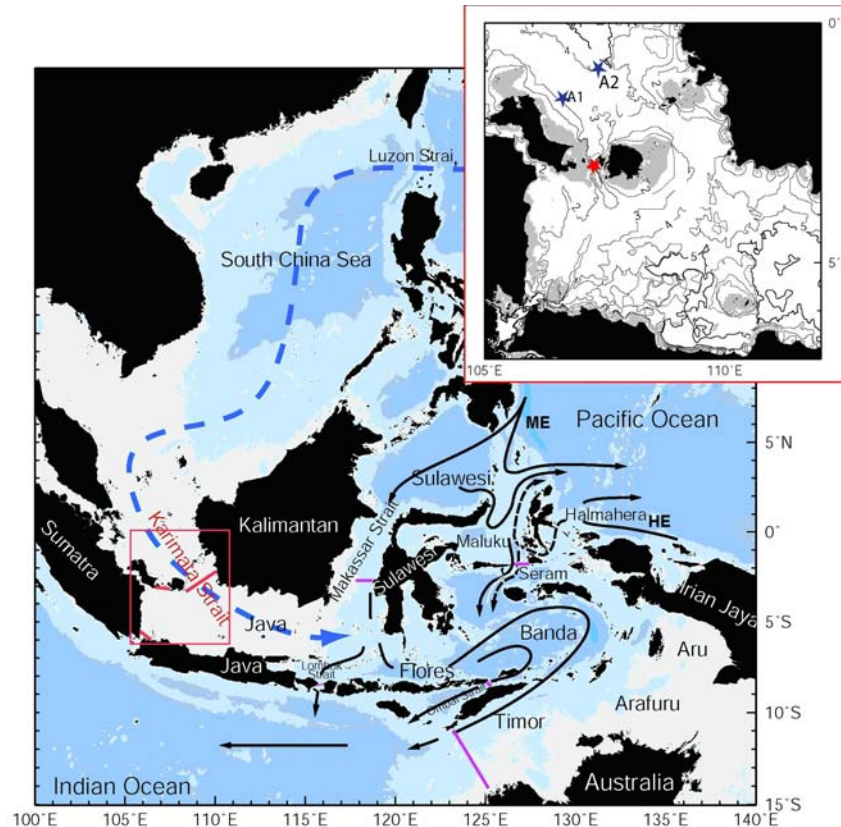
## **WORK COMPLETED**

- Three bottom mount ADCPs have been deployed in Karimata Strait in December 2007 (Figure 1). However, one of them failed to be turned on.
- In February 2008, we did try to recover however we had a problem with acoustic release. Despite the failure, we successfully retrieved partial ADCP data via modem.
- In May 2008, we did try to recover using ROV: two moorings (belong to FIO, China) have been recovered. However LDEO mooring can not be recovered. The ROV was on top of the

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mooring but failed to hook it due to strong tidal current. Combination of ROV and divers are needed to recover the LDEO mooring.

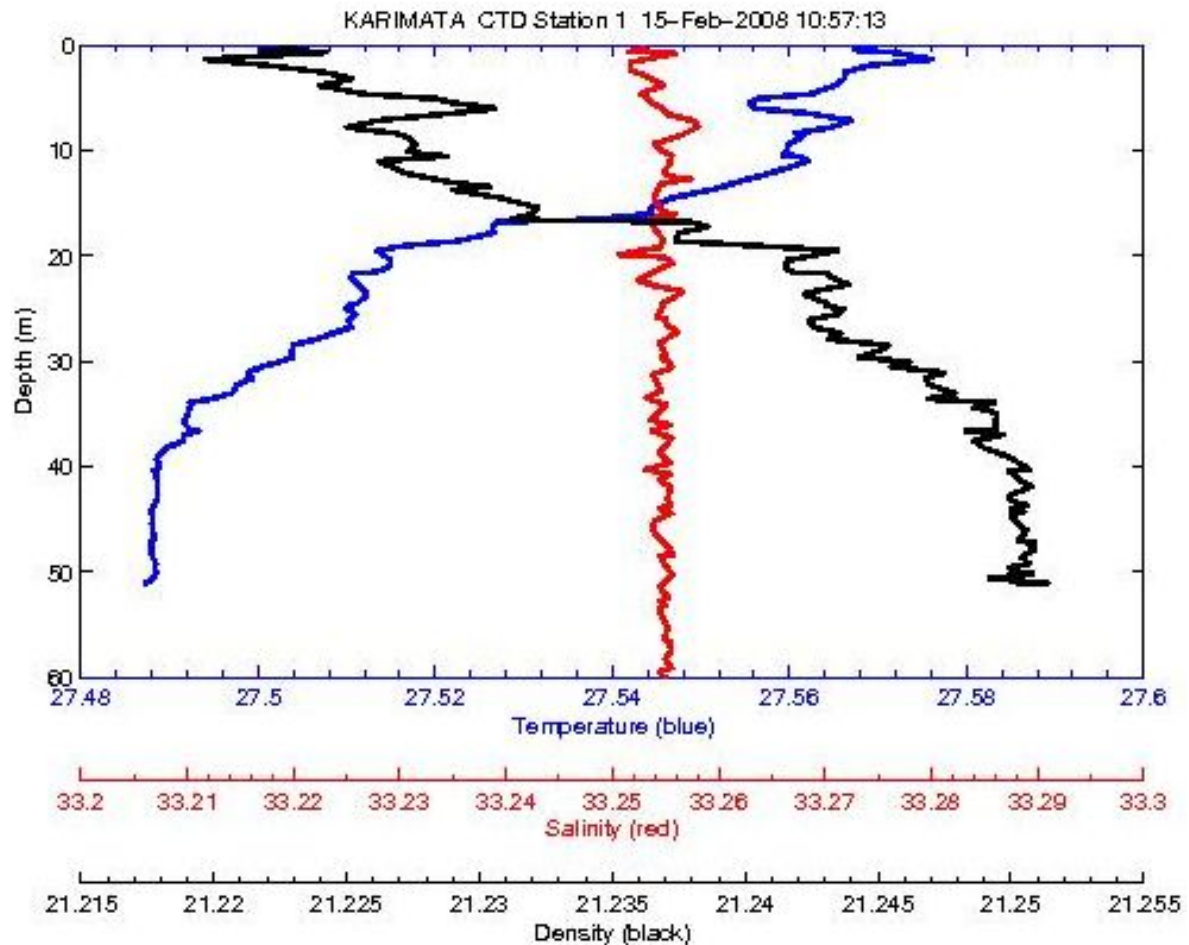
- We retrieved part of ADCP data via modem.
- After successfully refurbished one FIO moorings, we deployed in the Gaspar Strait between Bangka and Belitung Island (Figure 1).
- This DURIP grant provides support for instrument only. We will recover and redeploy these two moorings in October 2008 under new full grant.



*[Figure 1. ITF pathways and INSTANT mooring locations (magenta lines) and the TRBM locations in the Karimata Strait (blue-stars in the insert) deployed in December 2007 and red star deployed in May 2008]*

## RESULTS

- The partially recovered data is being analyzed. However, due to incomplete time series, we will wait until we got all data from all moorings for publication in peer review journal
- Preliminary results have been presented in Indian Ocean Panel meeting in Bali-Indonesia, May 2008; during INSTANT workshop in Lamont in the end of May 2008; and Bilateral scientific meeting in Bali July 2008.
- I received funding from NSF and my collaborators from their respected funding agencies to extend this field measurement.
- We plan to recover the two using divers and ROV in the end of October 2008 and add two more mooring under new grant.

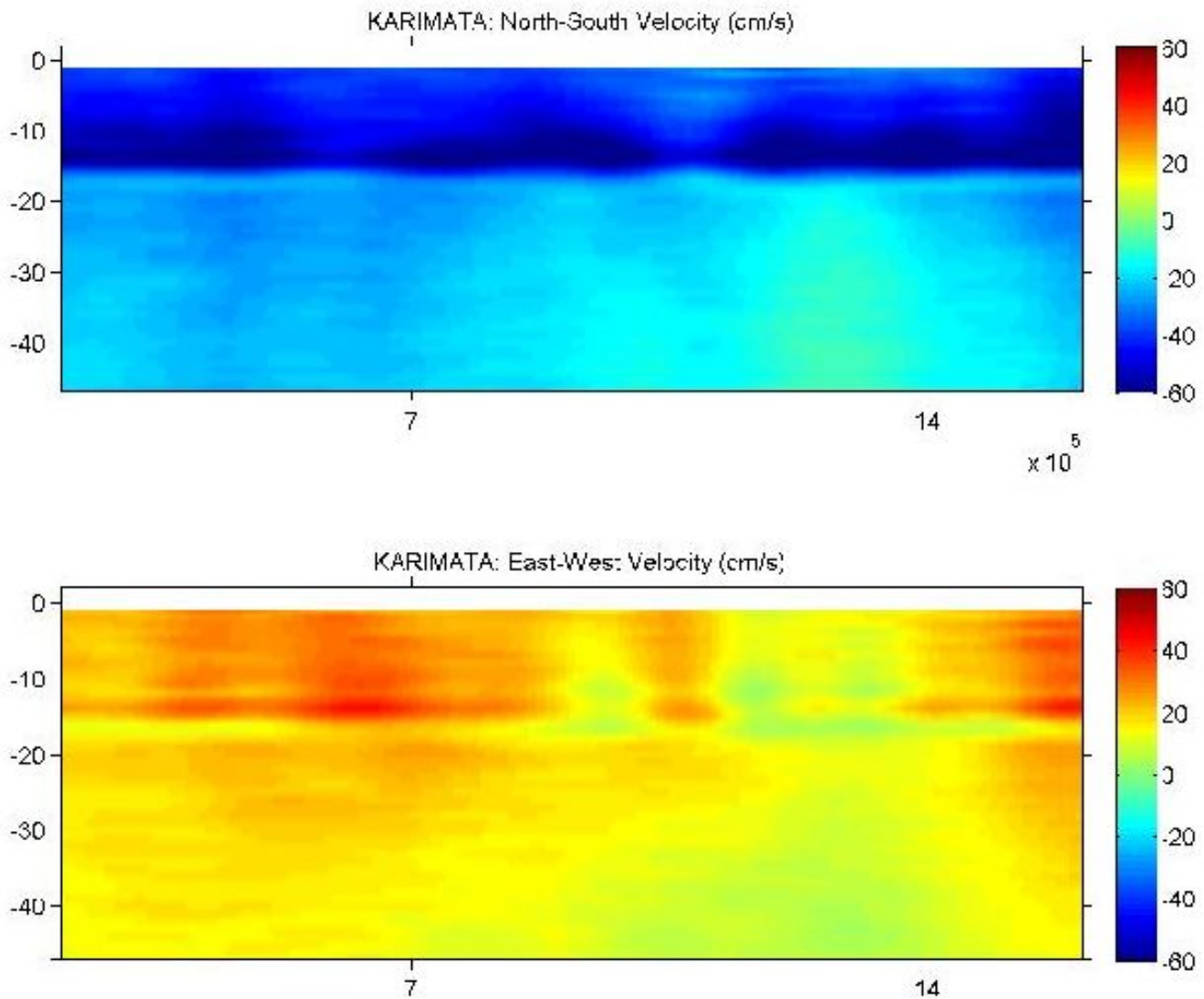


*[Figure 2. Example of the CTD cast in Karimata Strait]*

## IMPACT/IMPLICATIONS

Karimata Strait flow is very important for marine shipping and industry, fisheries and climate. Water exchange between South China Sea and Java Sea may affects on regional ocean circulation and climate. A seasonal variability of the SITE flow due to monsoon strongly affects the main ITF (Qu et al., 2005, Tozuka et al, 2007) and heat-flux into the Indian Ocean. Gordon, Susanto, and Vranes (2003) suggested that Java Sea water influences the vertical velocity profile of ITF in the Makassar Strait, thereby affecting the heat flux to the Indian Ocean and their air-sea interaction. The SITE flow also affects the heat balance in the SCS, which may in turn affect cyclone/typhoon development.

Having the success to have an international collaborative research among scientists from Indonesia, China and United States in pioneering on the field measurement of SITE flow, we all got new grants from respected funding agencies in each country to extend this field work. Therefore, we plan to recover and redeploy of these two moorings and add two new moorings under new grant.



[Figure 3. Example of North-South and East-West Velocity (cm/s) in the Karimata Strait]

## RELATED PROJECT

- ✓ Ongoing multidisciplinary project supported by ONR-DRI to understand archipelago strait dynamics in the Mindoro Strait and adjacent straits within the Philippine region.
- ✓ Ongoing multidisciplinary approach supported by ONR to determine the generation, propagation, and dissipation of internal waves in the South China Sea (NLIWI).
- ✓ Ongoing project supported by NOAA to measure long-term ITF variability in the Makassar Strait as a continuation of the INSTANT (International Nusantara Stratification and Transport) program, which was supported by NSF and completed in January 2007.
- ✓ Ongoing project supported by the Chinese NSF and led by Prof. Yao-chu Yuan of the Second Institute of Oceanography, China, by deployed moorings in the Luzon Strait in Spring 2008.
- ✓ Ongoing collaborative project (China-Indonesia) to deploy moorings in the Indian Ocean south of the Sunda Strait in November 2007. Chinese PIs led by Dr. Weidong Yu of the First Institute

Oceanography is supported by Chinese NSF and Indonesian PIs led Dr. Sugiarta (BRKP, Indonesia). Both of them have been my long-term collaborators.

- ✓ This extension of this SITE project has been funded by NSF starting Spring 2008. We plan to recover the two moorings in Karimata Strait and then put more additional two moorings.
- ✓ Ongoing Sunda Strait dynamics and its impact to seasonal migration as expansion of this international collaborative project. Two bottom mounted ADCPs will be deployed in the end of October 2008 in conjunction with SITE project.

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## PUBLICATIONS

Because the mooring that is supported under this DURIP grant has not been recovered and we only recovered partial data via modem, we will publish our results in international journals after all moorings are recovered in the end of October 2008.